

SPACE SCIENCE ADVISORY COMMITTEE

1 Dec. 2003

Dr. Edward Weiler
Associate Administrator for Space Science
NASA Headquarters
Washington, DC 20546

Dear Dr. Weiler,

The Space Science Advisory Committee (SScAC) met in public session November 17-18, 2003 at the NASA Ames Research Center. We were warmly welcomed at the beginning of our meeting by the Center Director Scott Hubbard. He set the tone of hospitality we felt throughout the meeting, from the smooth operation of the meeting logistics, facilities and meals to the informative tour of laboratory facilities.

We welcomed two new members of SScAC: Jonathan Grindlay, representing the astrophysics community, and Michelle Thomsen, the new chair of the Sun Earth Connection Subcommittee (SECAS). With their arrival we bade farewell to Charles Beichman and Dave McComas, who served three-year terms, and thanked them for their work on the committee. All members were in attendance throughout the meeting. We would also like to thank Marc Allen, Marian Norris, and their staff for their leadership and efforts in support of a successful meeting.

The first day of the meeting was dominated by consideration of the Bahcall Panel report regarding the future of the Hubble Space Telescope (HST) servicing missions. We had expected this issue to be somewhat controversial and had accordingly budgeted time in the schedule for public comment. As it turned out, the content of the discussion was distilled fairly quickly to the consensus items outlined in this letter and no public comment was offered. However, the committee received two letters regarding HST from interested external groups (included as attachments). We heard from Chris McKee, a member of the Bahcall committee; Anne Kinney, the Origins theme director; and the sub-committee chairs, who summarized the discussions from their respective sub-committee meetings. Steve Beckwith, the director of the Space Telescope Institute presented a briefing describing the science that could be carried out if HST were to operate with only two gyros.

We received our annual ethics briefing by Kevin Kouba and heard reports from Anne Kinney, Richard Fisher, and Orlando Figueroa regarding issues in their respective themes. Dave Bohlin described a proposal to rationalize honoraria for review teams.

We continued with our tradition of excellent noon-time talks from leading space scientists. On Monday Robert Lin reviewed the outstanding results of the RHESSI mission's pioneering observations of solar high-energy radiations. On Tuesday Dave Des Marais and Chris McKay introduced us to the astrobiological science activities at Ames. These timely presentations were of great interest following the enlightening tour of some of the Ames laboratories that the committee enjoyed on the previous evening.

Ron Greely and Torrence Johnson, chair and co-chair of the JIMO Science Definition Team (SDT), gave us a summary of the SDT deliberations and conclusions regarding the science requirements for the JIMO mission.

RECOMMENDATIONS

The Future of HST

At our previous meeting of SScAC the Bahcall Committee Report had just been released and we were awaiting the release of the Columbia Accident Investigation Board (CAIB) report to better understand the issues with using the Shuttle to service the Hubble Space Telescope (HST). We appreciate now that the CAIB report has significantly changed the environment in which the Shuttle must operate. It is no longer to be thought of as an operational system. The report states "...operation of the Space Shuttle, and all human space flight, is a developmental activity with high inherent risks." It was with this new perspective that SScAC considered the recommendations of the Bahcall panel convened to consider the transition from HST to James Webb Space Telescope (JWST) science operations.

The Bahcall panel considered three options for future Shuttle servicing missions (SMs) to service and upgrade the instrumentation on HST. In their report these options were prioritized as follows:

1. Two additional Shuttle servicing missions, SM4 in about 2005 and SM5 in about 2010, in order to maximize the scientific productivity of the Hubble Space Telescope. The extended HST science program resulting from SM5 would only occur if the HST science was successful in a peer-reviewed competition with other new space astrophysics proposals.
2. One Shuttle servicing mission, SM4, before the end of 2006, which would include replacement of HST gyros and installing improved instruments. In this scenario, the HST could be de-orbited, after science operations are no longer possible, by a propulsion device installed on the HST during SM4 or by an autonomous robotic system.
3. If no Shuttle servicing missions are available, a robotic mission to install a propulsion module to bring the HST down in a controlled descent when science is no longer possible.

The report stressed that peer-review competition was a guiding principle in the selection of science missions within OSS. SM-5 should be peer-reviewed and funded through existing funding lines, such as the Explorer/Discovery lines, wherein the science component of SM-5 mission could be competed against proposals with similar science goals and cost. [As noted in a letter to SScAC dated 16 Nov. 2003, after their report was issued the Bahcall panel was informed that the costs associated with the science

component of SM-5 would be substantially greater than the estimates available to the committee during its deliberations.] Therefore some other plan for an appropriate competition with “comparably sized astrophysics programs” should be worked out that will not undermine priorities in the NRC Decadal Surveys, which have consistently recommended a robust (and accelerated) program of peer-reviewed, PI-led Explorer and Discovery class missions. Moreover the key assumption regarding the launch date of SM-4 appears to have been invalid. NASA now expects a SM-4 flight no earlier than mid 2006 or early 2007.

The SScAC received reports from its four subcommittees regarding the Bahcall report and heard presentations by NASA management and Chris McKee, one of the authors of the report. Aware of the new realities regarding Shuttle usage and availability, the SScAC found strong consensus on the following items.

1. The SScAC affirms the enormous scientific contributions that have been made by HST, and has no doubt that an extended HST mission enabled by the SM-4 servicing mission would continue that heritage.
2. The overriding criterion for the selection of missions in OSS is compelling science content. Furthermore, any future peer-reviewed competition for HST-related missions should be judged against missions of comparable size. In view of the estimated cost of SM-5, the subcommittees felt that the use of the Explorer/Discovery mission lines was inappropriate. **SScAC does not endorse any plan that adversely affects the Explorer or Discovery mission lines.**
3. The SScAC strongly supports SM-4 because it will clearly achieve first-rate science, in the long-standing tradition of HST. The increased wavelength coverage and sensitivity of Wide Field Camera 3 (WFC3) as planned would represent a more than ten-fold improvement over existing ultraviolet and infrared capabilities, while the planned improvements in the Cosmic Origins Spectrograph (COS) should enable HST to make forefront contributions in the years ahead to our understanding of both the “local” neighborhood and “distant” universe. In addition, new gyros and batteries should enable HST to operate to the end of the decade provided a servicing mission can be accomplished without additional delays

We also recognize there are significant threats to completing SM-4, including access to the Shuttle and the ever-increasing costs of delaying the mission past FY04. Moreover, extension of the useful life of HST requires a servicing mission before hardware failures occur that prevent it. **The SScAC reaffirms the high scientific priority of SM-4, and recommends that SM-4 be carried out at the earliest possible date. NASA should execute existing plans and schedule this mission for as soon as possible after the safe return of the space shuttle to flight status.**

SScAC further recommends that, after SM-4, NASA should continue to operate HST as long as the science capability is compelling and unique, or until the need to de-orbit HST safely requires a graceful end to this extremely successful space science mission.

4. The first option proposed by the Bahcall committee calls for NASA to carry out two servicing missions, SM-4 and SM-5. This option also raised several issues and concerns including the future availability of Shuttle, the availability of future OSS funding, and the science value of HST compared to other new, yet to be approved, science initiatives. SM-4 is called out in the OSS strategic plan and initial funding has been identified. **SScAC recommends that any servicing of HST beyond SM-4 should be considered during the strategic planning process, wherein the science value of SM-5 would be compared to other future science initiatives in the Origins program.** This approach is consistent with two principles that have enabled OSS science programs to succeed over the last decade: 1) the principle of strategic planning based on the most compelling science objectives identified in a broad, community-wide discussion; and 2) the principle of a discipline-balanced program, with cooperation and mutual support across the Enterprise enabling striking successes on a broad front. Significantly deviating from these principles could seriously cripple the effectiveness of the OSS in the future.

Discovery

The SScAC endorses Orlando Figueroa's plan for process improvements in the Discovery and New Frontiers mission lines. We were very pleased to see that this plan implements the recommendations made by the SScAC at our last meeting. A key element is the restructuring of the Discovery and New Frontiers Program offices to reflect the Explorer Program model for program management, systems engineering and flight assurance support.

Science Centers

The SScAC appreciated the information provided by Anne Kinney regarding Science Centers and their selection. **SScAC remanded this issue back to the Origins Subcommittee for further study.**

JIMO

The Jupiter Icy Moons Orbiter (JIMO) Science Definition Team (SDT) presented a summary of the process used to arrive at their recommended science objectives for this mission. **We commend the SDT for their thorough and inclusive work, and for their efforts in prioritizing measurement objectives from the diverse input received.** The proposed science is exciting and well aligned with the NRC Solar System Exploration Decadal Survey goals and NASA strategic planning.

The measurement requirements for JIMO present challenges in the development of instruments that take advantage of the capabilities offered by Project Prometheus. **We recommend that Project Prometheus follow the lead of the JIMO SDT by maintaining close ties with the science community during the phasing of JIMO instrument and Project Prometheus spacecraft development and integration activities.** We are encouraged by the apparent good relations between the solar system exploration program and Project Prometheus, and the promise of closer relations in the future between the broader OSS community and the Project by including scientists from other Space Science themes.

ST-5

The SECAS brought before the committee an issue regarding ST-5, a New Millennium mission of high priority to the Sun-Earth Connections research (SEC) community. The mission will provide flight validation of mission-critical elements needed for Magnetospheric Constellation and other multi-spacecraft SEC missions in the Solar Terrestrial Probes queue. Prompt flight validation is required to reduce the risk for these other missions. Despite diligent efforts by the program to find a launch ride of opportunity as a secondary payload, none has been found, placing the ST-5 flight at serious risk. The program has no budget to purchase access to space. **SScAC supports SECAS' recommendation that a dedicated Pegasus launch vehicle be purchased and that the launch of ST-5 proceed as soon as possible. The consequential delays of ST-10 and ST-11 that would result from the increased cost of this option are deemed an equitable and reasonable programmatic tradeoff.**

Honoraria

The SScAC considered a proposal to standardize policy concerning honoraria for panel reviewers. We heard that there are approximately 100 NRA panels constituted each year to evaluate research proposals submitted to the SR&T and other programs. In view of the additional cost and the unclear benefit to be derived, **SScAC recommends that current policy regarding honoraria not be changed.**

Sounding Rocket Operations

The committee's briefing on the status and plans in the sounding rocket (SR) program could not be sufficiently discussed due to time constraints. There are evidently serious funding issues throughout the program: for example, insufficient funds were available to carry out the currently planned flights at White Sands and the campaign in Kwajalein. A new capability was demonstrated for "tailored" trajectory experiments, but the required rocket motors are not currently available. A development plan for new technology was presented, but the lack of dedicated funding caused the committee to wonder whether this plan is likely to meet its goals. **Given the value of this program as outlined in the OSS strategic plan, SScAC looks forward to an opportunity to fully air the issues raised by this briefing at a future SScAC meeting.**

Sincerely

Andrew B. Christensen
SScAC Chair

Attachments:
SECAS Report
SSES Report
OS Report
SEUS Report
Letter from the Space Telescope Users Committee
Letter in support of the Explorer Program
Letter from the Bahcall committee